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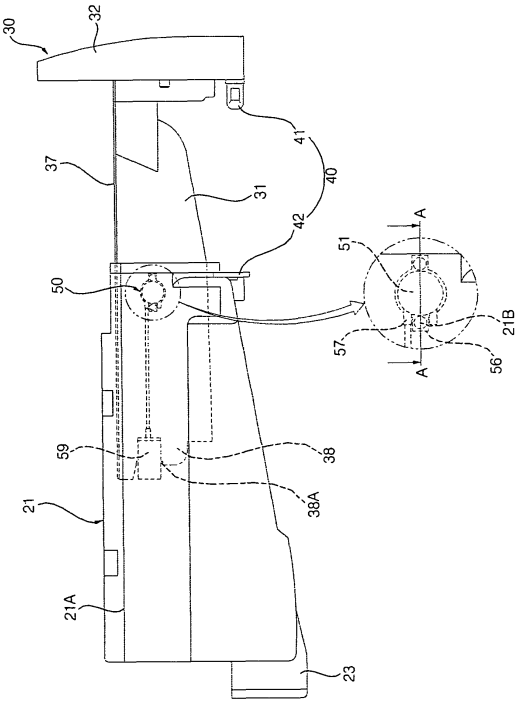
(54) Washing machine

(57) A washing machine (1) includes a detergent dispenser (20) with a removable detergent box (30), a locking unit (40), and an automatic withdrawing unit (50). The locking unit (40) may lock or unlock the detergent box (30) once it is inserted into the dispenser (20). The automatic withdrawing unit (50) utilizes a wire (55) wound on a spring biased reel (54) to pull the detergent box (30) to a withdrawn state when the locking unit (40) is unlocked.

FIG. 3



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Description

[0001] This application claims priority under 35 U.S.C. § 119(a) to Korean Patent Application No. 10-2006-0093122, filed on September 25, 2006, the entire contents of which are hereby incorporated by reference.

BACKGROUND

1. Field

[0002] The present invention relates to a washing machine, and more particularly, to a detergent box of a washing machine.

2. Background

[0003] In general, a washing machine refers to an apparatus for washing clothes and sheets (hereinafter, referred to as "laundry") via a wash, rinse, and dehydration process to remove dirt from the laundry using water, detergent, and a mechanical action. The washing machine typically includes a tub and drum that is rotatably provided therein and that holds wash water and laundry. A driving motor is provided at one side of the tub and drum. The washing machine activates a wash operation by power of the driving motor, and performs a laundry washing operation. The washing machine further includes a water supplying unit and a water discharging unit. A detergent supplying unit is often provided in the water supply system so that incoming water washes detergent in the unit into the washing bath.

[0004] The detergent supplying unit may include a dispenser provided on the water supply unit; and a detergent box provided within the dispenser. The detergent box may be designed to be withdrawn from the dispenser, and be completely disengaged outside the washing machine.

[0005] The related art washing machine described above has a drawback in that it may be inconvenient and complicated to use. Typically, the user must withdraw the detergent box from the dispenser, put detergent into the detergent box, and then insert the detergent box back into the dispenser. During these procedures, the detergent box may be incompletely inserted into or withdrawn from the dispenser due to a malfunction occurring when a user directly withdraws or inserts the detergent box.

BRIEF DESCRIPTION OF THE DRAWINGS

[0006] The embodiments will be described in detail with reference to the following drawings in which like reference numerals refer to like elements, and wherein:

[0007] FIG. 1 is a partial exploded perspective view illustrating a drum type washing machine;

[0008] FIG. 2 is an exploded perspective view illustrating a detergent supplying unit of the washing machine shown in FIG. 1;

[0009] FIG. 3 is a side view illustrating a detergent box and a dispenser housing of the detergent supplying unit shown in FIG. 2;

[0010] FIG. 4 is a cross-sectional view taken along section line A-A in FIG. 3;

[0011] FIG. 5 is a perspective view illustrating an automatic withdrawing unit of the detergent supplying unit shown in FIG. 2;

[0012] FIG. 6 is a partial cutaway perspective view illustrating the main parts of the automatic withdrawing unit shown in FIG. 5;

[0013] FIG. 7 is a perspective view illustrating an automatic withdrawing unit according to another embodiment;

[0014] FIG. 8 is a partial cutaway perspective view illustrating the main parts of the automatic withdrawing unit shown in FIG. 7;

[0015] FIG. 9 is a side view illustrating a detergent box and a dispenser housing in a detergent supplying unit according to another embodiment; and

[0016] FIG. 10 is an exploded perspective view illustrating the main parts of the detergent box and the dispenser housing shown in FIG. 9.

DETAILED DESCRIPTION

[0017] Referring to FIG. 1, the drum type washing machine 1 includes a cabinet 1 having a left surface, a right surface, and a rear surface. A tub 4 is mounted inside the cabinet 2 by one or more springs 3 and a damper (not shown). A drum 5 is rotatably provided inside the tub 4. The drum holds laundry and has a plurality of water holes 5A for allowing passage of the wash water into and out of the tub. A lifter 6 is provided inside the drum 5 to draw up the wash water and drop the drawn-up wash water at a predetermined height within the drum 5. A driving unit 7 is provided behind the tub 4 to apply a rotary force to the drum 5.

[0018] A cabinet cover 8 is provided in front of the cabinet 2, and has a laundry opening 8A at its center. A top plate 9 and a base 10 are provided on an upper surface and a lower surface of the cabinet 2, respectively. A door 11 is rotatably mounted on the cabinet cover 8, and opens and closes the laundry opening 8A. A control panel 12 is provided at an upper side of the cabinet cover 8, and displays and controls operation of the drum type washing machine 1.

[0019] A water discharging unit (not shown) is provided between the base 10 and the tub 4, and discharges wash water from the tub 4. A water supplying unit 13 includes a water supply hose 13A, a water supply valve 13B, and a water supply bellows 13C. The water supplying unit 13 is provided between the top plate 9 and the tub 4, and supplies water into the tub 4.

[0020] As shown in more detail in FIGS. 2-5, a detergent supplying unit 14 is provided on a water supply path of the water supplying unit 13, and supplies detergent to

the tub 4 together with water. The detergent supplying unit 14 connects between the water supply hose 13A and the water supply bellows 13C. The detergent supplying unit 14 is mounted on the cabinet 2 and the cabinet cover 8 such that the detergent box 30 is withdrawn and inserted through a doorway hole part 12A provided at one side of the control panel 12.

[0021] The detergent supplying unit 14 includes a dispenser 20 connecting with the water supply hose 13A and the water supply bellows 13C. A detergent box 30 inserted into the dispenser 20 and can be withdrawn frontward via the opening 20A of the dispenser 20 and the doorway hole part 12A. Flange parts 37 are provided at both sides of the detergent box, and extend along a movement direction. A locking unit 40 acts to lock or unlock the detergent box 30 when it is inserted into the dispenser 20. An automatic withdrawing unit 50 moves the detergent box 30 to the front within the dispenser 20 when the locking unit 40 unlocks the detergent box 30.

[0022] The dispenser 20 includes a dispenser housing 21 provided to communicate with the doorway hole part 12A of the control panel 12. The dispenser 20 is open at a front side and an upper side. A dispenser cover 22 is mounted at the opened upper side, and has water supply holes 24B for supplying water into the detergent box 30.

[0023] The dispenser housing 21 has a water discharge port 23 provided at a rear thereof which is connected with the water supply bellows 13C such that water and detergent falling from the detergent box 30 are supplied to the tub 4 through the water supply bellows 13C. The dispenser housing 21 has step parts 21A provided at both upper sides thereof. The flange parts 37 of the detergent box 30 are mounted on and slide along the step parts 21A. The step parts 21A, together with the dispenser cover 22 provide slots in which the flange parts 37 move.

[0024] The dispenser cover 22 includes a bottom panel 24 mounted at the opened upper side of the dispenser housing 21 and a top panel 25 mounted on the bottom panel 24, and forming a flow path together with the bottom panel 24. The bottom panel 24 has a plurality of hose connecting parts 24A provided in rear thereof and connecting with the one or more water supply hoses 13A. The bottom panel 24 has a plurality of water supply holes 24B supplying water and provided in positions corresponding to detergent retaining parts of the detergent box 30. A flow path 24C is formed between the top panel 25 and the bottom panel 24, and the flow paths guide water from the hose connecting parts 24A to the water supply holes 24B.

[0025] The detergent box 30 includes a detergent box body 31 inserted into a space between the dispenser housing 21 and the dispenser cover 22 such that it can be withdrawn frontward. The detergent box includes a plurality of detergent retaining parts 31A, 31B, 31C, and 31D for retaining detergent. A front panel 32 is provided in front of the detergent box body 31. A detergent box cap 33 is mounted on the detergent box body 31.

[0026] The detergent box body 31 is of a box shape and is opened at an upper side and a rear side thereof. As mentioned above, the flange parts 37 are movably mounted on the stepped parts 21A of the dispenser housing.

[0027] The plurality of detergent retaining parts 31A, 31B, 31C, and 31D include first and second powder detergent retaining parts 31A and 31B, each provided so that they extend along the box on left right sides of the detergent box body 31. These retaining parts are used to hold powder detergent used for washing and prewashing. A bleach retaining part 31C and a softener retaining part 31D are provided at inner rear sides of the first and second powder detergent retaining parts 31A and 31B. Typically, bottom surfaces of these retaining parts are spaced above the bottom surface of the detergent box so that they hold less volume.

[0028] The first and second powder detergent retaining parts 31A and 31B are opened at upper sides to allow for the input of powder detergent and water. They are opened at rear sides to discharge the powder detergent and water to the dispenser housing 21. The bleach retaining part 31C and the softener retaining part 31D are of box shapes that are also opened at upper sides to allow for the input of bleach and softener. The bleach retaining part 31C and the softener retaining part 31D have siphon pipes 34 that protrude up from their bottoms to communicate with spaces below the bleach retaining part 31C and the softener retaining part 31D.

[0029] The front panel 32 is provided in front of the doorway hole part 12A in the same structure as the control panel 12, and forms a front surface of the drum type washing machine 1 together with the control panel 12 and the cabinet cover 8. The detergent box cap 33 is mounted on the upper side of the detergent box body 31 to cover upper sides of the bleach retaining part 31C and the softener retaining part 31D. The detergent box cap 33 has input holes 33A for inputting the bleach and the softener, each provided correspondingly to the bleach retaining part 31C and the softener retaining part 31D. A siphon cap 35 capping the siphon pipe 34 protrudes downward from a bottom of the detergent box cap 33 such that the input bleach and softener are discharged from the bleach retaining part 31C and the softener retaining part 31D due to a siphon phenomenon.

[0030] Referring to FIG. 2, the dispenser 20 includes a catch jaw 26 protruding inward from a front and lower surface of the bottom panel 24. The detergent box 30 includes a height control protrusion 36 protruding from an upper surface of the detergent box cap 33 to be caught by the catch jaw 26 when the detergent box 30 is withdrawn. The height control protrusion 36 can be controlled in height to avoid interference from the catch jaw 26. Thus, a withdrawal distance of the detergent box 30 is set by the catch jaw 26 and the height control protrusion 36. If the height control protrusion 36 is lowered, it can avoid being caught by the catch jaw 26 and thus, the detergent box 30 can be completely disengaged from the

dispenser 20.

[0031] Referring to FIGS. 1 and 3, the locking unit 40 is provided between the dispenser 20 and the detergent box 30 such that it locks the detergent box 30 when the detergent box 30 is first inserted into the dispenser 20, and unlocks the locked detergent box 30 when the locked detergent box 30 again moves into the dispenser 20. In other words, the locking unit 40 includes a locking hook 41 provided on the detergent box 30 and a toggle switch 42 provided on the dispenser 20 or a control panel 12. The locking unit 40 toggles back and forth between locked and unlocked positions. The locking hook 41 is mounted at a lower side on a rear surface of a front panel 32 of the detergent box 30. The toggle switch 42 is provided at a lower side of the dispenser housing 21 at a position corresponding to the locking hook 41. The toggle switch 42 has an insertion groove provided at its center which allows an end of the locking hook 41 to be inserted therein. The toggle switch 42 is provided on a rear surface of the control panel 12 such that the insertion groove of the toggle switch matches with an insertion hole 12B that is provided at a lower side of a doorway hole part 12A of the control panel 12. Alternately, the toggle switch 42 can be directly provided at a lower front of the dispenser housing 21 such that the insertion groove matches with the insertion hole 12B.

[0032] Referring to FIGS. 2 to 6, the automatic withdrawing unit 50 includes a housing 51 that can be mounted at a front part of the dispenser housing 21. A rotary shaft 52 is rotatably mounted within the housing 51. An elastic part 53 is provided between the rotary shaft 52 and the housing 51. The elastic part 53 biases the rotary shaft 52 in a rotational direction that causes the detergent box 30 to be withdrawn when the locking unit unlocks the detergent box 30. A reel 54 is also mounted on the rotary shaft 52. A wire 55 is wound on the reel part 54 and end of the wire 55 is connected to a rear part of the detergent box 30.

[0033] Automatic withdrawing units 50 may be provided at both sides of the dispenser housing 21. Ends of the wires 55 each connect to side parts of the detergent box body 31. Alternately, the housing part 51 can be provided at the rear part of the detergent box body 31, and an end of the wire part 55 can connect to a front part of the dispenser housing 21. Also, although this embodiment uses a wire to connect the detergent box to the housing, in alternate embodiments, thin flexible members other than wires could be used. For instance, a synthetic monofilament or woven strand could be used.

[0034] The housing 51 is of a tank shape having an internal void space to house the rotary shaft 52, the reel 54, and the elastic part 53 therein. A flange 56 having a hole is provided at an outer side of the housing 51, and is coupled and fixed by a coupling member 27 to a coupling boss 21B provided at a side part of the dispenser housing 21. However, the housing part 51 can also be attached to the side part of the dispenser housing 21 by a hook and a hook hole, an adhesive, or fusion.

[0035] A wire doorway 57 is provided at one side of the housing 51, and enables entrance and exit of the wire 55. Wire doorways 57 may be provided on opposite sides of the automatic withdrawing unit 50 so that the same basic withdrawing unit can be mounted on either side of the dispenser housing 21.

[0036] A partitioning wall 58 is provided within the housing 51. The partitioning wall 58 partitions an internal space of the housing 51 into a reel housing space 51A and a spring housing space. The partitioning wall 58 has a first through-hole 58A provided at its center to allow the rotary shaft 52 to pass therethrough. The housing 51 has a second through-hole 51C and a third through-hole 51D provided at both side surfaces and which also allow ends of the rotary shaft 52 to pass therethrough. Stoppers 52A and 52B are provided at both ends of the rotary shaft 52 such that the rotary shaft 52 is not arbitrarily released from the housing 51.

[0037] In this embodiment, the elastic part 53 includes a spiral spring 53 provided within the spring housing space 51B of the housing part 51. Ends of the spiral spring 53 connect to the housing part 51 and the rotary shaft 52, respectively. The rotary shaft 52 passes through and connects to a rotation center of the reel part 54. A first end of the wire 55 is attached to a circumference of the reel 54. The wire is wound on the reel 54 and extends outside through the wire doorway 57. The other end of the wire 55 is attached to a holder 59. The holder 59 is detachably caught by catch parts 38 provided at ends of the detergent box body 31. As shown in FIGS. 2 and 5, the catch part 38 extends rearward from the side of the detergent box body 31, and the holder 59 is caught in such a manner that it covers the catch part 38. The catch part 38 has a catch groove 38A for inserting the holder 59 therein to prevent arbitrary release of the holder 59.

[0038] A user would first input laundry inside the drum 5 through the laundry opening 8A, and then close the laundry opening 8A by the door 11. After that, the user inputs powder detergent, and possibly bleach and softener into the detergent box 30, and sets a desired washing cycle by manipulating the control panel 12.

[0039] Upon activation, water and detergent are supplied into the tub 4 using the water supplying unit 13 and the detergent supplying unit 14. In detail, the water supplying unit 13 opens the water supply valve 13B, and supplies water into the tub 4 via the water supply hose 13A and the water supply bellows 13C. The detergent supplying unit 14 squirts the water introduced into the water supply hose 13A, into the first and second powder detergent retaining parts 31A and 31B or into the bleach retaining part 31C via the water supply hole 24B of the dispenser cover 22. At this time, the powder detergent and/or the bleach in the detergent box 30 will be washed out of the detergent box by the water squirted in from the water supply hole 24B. The mixed water and detergent and bleach would exit the bottom of the dispenser housing 21, and would be supplied into the tub 4 via the water supply bellows 13C connecting to the dispenser housing

21. Once the water, the powder detergent, and the bleach are in the tub 4, the drum 5 is rotated using the driving unit. As the drum 5 rotates, the laundry is lifted up by the lifter 6 and falls down, thereby implementing laundry washing.

[0040] Upon completion of a wash cycle, the motor 7 is stopped, and the wash water retained in the tub 4 is discharged outside using the water discharging unit. After that, water is again supplied into the tub 4 up to a predetermined water level using the water supplying unit 13, and the drum 5 is again rotated using the motor 7, thereby implementing laundry rinsing. At this time, the detergent supplying unit 14 may also supply water to the softener retaining part 31D of the detergent box 30. This would cause the softener to be dispensed from the softener retaining part 31D into the tub 4. Upon completion of a laundry rinse cycle, the rinse water is discharged outside using the water discharging unit. When water discharge is executed in the rinse cycle, a dehydration cycle in which the drum 4 is rotated by the motor 5 at high speed is implemented, thereby removing the wash water from the laundry.

[0041] A procedure of withdrawing or inserting the detergent box 30 so as to input washing aids into the detergent retaining parts 31A, 31B, 31C, and 31D will be described in more detail below.

[0042] The detergent box 30 is withdrawn by first slightly pushing the front panel 32 of the detergent box 30 into the dispenser 20, and then removing an applied force from the front panel 32. When the detergent box 30 is locked in the closed position by the locking unit 40, and the detergent box is pushed slightly rearward, the locking hook 41 of the detergent box 30 releases its lock state with the toggle switch 42. This frees the detergent box so that it can be withdrawn.

[0043] At this time, the rotary shaft 52, which is biased by the elastic part 53, rotates in the withdrawal direction. The reel 54 rotates together with the rotary shaft 52, thereby winding the wire 55 onto the reel part 54. As the wire is wound upon the reel, the detergent box 30 is withdrawn a predetermined distance frontward. At some point in the withdrawal movement, the control protrusion 36 of the detergent box cap 33 is caught by the catch jaw 26 of the dispenser cover 22, thereby stopping the withdrawal of the detergent box 30.

[0044] The detergent box 30 is inserted by pushing the detergent box 30 back into the dispenser 20 until the front panel 32 aligns with the doorway hole part 12A of the control panel 12. At this time, the locking hook 41 is inserted into the insertion hole 12B. The locking hook 41 passes through the insertion hole 12B and is inserted into the insertion groove and is locked by the toggle switch 42. This holds the detergent box in the closed position.

[0045] A dispenser as described above is easier to use, and does not have a problem with the detergent box being incompletely withdraw or inserted into the dispenser. The detergent box 30 is automatically withdrawn, and it can be inserted again by simply pressing the detergent box 30 inside the doorway hole part 12A of the control panel 12.

[0046] The detergent box 30 can be disengaged from the dispenser 20 by pressing downward on the height control protrusion 36 so that it will not be caught by the catch jaw 26. Thus, the detergent box 30 can be fully removed and washed with simplicity and convenience.

[0047] FIGS. 7 and 8 illustrate an automatic withdrawing unit 100 having a different construction from the automatic withdrawing unit 50 shown in FIGS. 4 to 6. FIG. 7 is a perspective view illustrating the alternate embodiment. FIG. 8 is a partial cutaway perspective view illustrating the main parts of the automatic withdrawing unit 100 shown in FIG. 7. Like reference numerals denote like elements in FIGS. 7 and 8. The following description will focus on the differences between the two embodiments.

[0048] The automatic withdrawing unit 100 shown in FIGS. 7 and 8 is different from the automatic withdrawing unit 50 shown in FIGS. 4 to 6 in that it further includes a damping unit 60 for limiting a withdrawal speed of the detergent box 30. The damping unit 60 includes a rotary damper 60 mounted on an opened side of the housing 51 and which is connected to an end of the rotary shaft 52. A flange 61 having a hole is provided at an outer side of the rotary damper 60, and is coupled and fixed to the housing 51 by a coupling member 62. However, the rotary damper 60 can also be mounted on the housing 51 by a hook, an adhesive, and fusion.

[0049] The rotary damper 60 connects to an end of the rotary shaft 52 that passes through the second through-hole 51C of the housing part 51. A stopper connecting part 64 is provided at one end of the rotary shaft 52. Like the stopper 52A shown in FIGS. 4 to 6, the stopper connecting part 64 prevents arbitrary release of the rotary shaft 52, and connects with a rotary shaft 63 of the rotary damper 60. Thus, the stopper 52B used in the previous embodiment can be omitted.

[0050] The automatic withdrawing unit 50 having the rotary damper 60 limits the withdrawal speed and insertion speed of the detergent box 30 using a damping action of the rotary damper 60. Therefore, the detergent box 30 is prevented from suddenly moving and is withdrawn or inserted slowly. Accordingly, damage and impact noise of the detergent box 30, which can happen during sudden withdrawal and insertion movements, are prevented. Because the withdrawal and insertion of the detergent box 30 occurs slowly and smoothly, due to the rotary damper 60, detergent, bleach and softener in the detergent box can be prevented from spilling out.

[0051] FIGS. 9 and 10 illustrate a detergent supplying unit 114 having a different construction from the one shown in FIGS. 2 and 3. FIG. 9 is a side view illustrating a detergent box 30 and a dispenser housing 21 in the detergent supplying unit 114 of the alternate embodiment. FIG. 10 is an exploded perspective view illustrating the main parts of the detergent box 30 and the dispenser

housing 21 shown in FIG. 9. Like reference numerals denote like elements in FIGS. 9 and 10. The following description will focus on the differences between the embodiments.

[0052] The detergent supplying unit 114 of FIG. 9 is different from the detergent supplying unit 14 of FIG. 2 in that it further includes a guide unit 70 for movably supporting flange parts 37 of the detergent box 30 on both sides of the dispenser housing 21 by a rolling contact method. Referring to FIGS. 9 and 10, each guide unit 70 includes a support frame 71 provided at a side part of an inner surface of the dispenser housing 21. A pair of rollers 72 and 73 are provided above and below the flange part 37 on the support frame 71. Roller connectors 74 rotatably connect the rollers 72 and 73 to the support frame 71. Guide units 70 are provided at both sides of the dispenser housing 21, respectively, and support the flange parts 37 of the detergent box 30.

[0053] The support frame 71 includes a mounting part 75 which is located adjacent an inner surface of the dispenser housing 21. The support frame 75 supports one side of the roller connectors 74. An upper support part 76 and a lower support part 77 are attached to the mounting part 75, and they rotatably support the other sides of the roller connectors 74. Shaft holes (not shown) are provided on the upper part and a lower part and they rotatably support ends of the roller connectors 74. The mounting part 75 has a coupling hole such that it is coupled to a connecting part 21C provided on a side part of the dispenser housing 21 by a coupling member 27.

[0054] The upper support part 76 has a structure that horizontally extends from the upper part of the mounting part 75 inside the dispenser housing 21 and which is then bent downward. The lower support part 77 has a structure which horizontally extends from the lower part of the mounting part 75 inside the dispenser housing 21 and which is then bent upward. The upper support part 76 and the lower support part 77 are provided such that their ends are spaced apart from each other by a height sufficient to allow the flange part 37 to be inserted therebetween.

[0055] The rollers 72 and 73 include an upper roller 72 and a lower roller 73 that contact an upper surface and a lower surface of the flange part 37. The upper roller 72 and the lower roller 73 are mounted on the support frame 71 such that two pairs of the rollers are spaced apart from each other in a movement direction of the flange part 37. However, more than two pairs of upper rollers 72 and the lower rollers 73 can be provided.

[0056] Fitting protrusions 137 are provided on the upper surface and the lower surface of the flange part 37, and they also extend in the movement direction of the detergent box 30. Fitting grooves 72A and 73A for mating with the fitting protrusions 137 are provided on circumferential surfaces of the rollers 72 and 73.

[0057] The roller connectors 74 are inserted into holes provided at rotation centers of the rollers 72 and 73. Ends of the rotary shafts 74 are rotatably fitted at their both ends to the first shaft hole (not shown) and the second shaft hole (not shown).

[0058] In a detergent supplying unit 114 including the guide units 70, the rollers 72 and 73 of the guide units 70 smoothly and softly support the flange part 37 by a rolling contact method when the detergent box 30 is withdrawn or inserted. Accordingly, sensitivity reduction and noise generation caused by friction of the detergent box 30 are prevented when the detergent box 30 is withdrawn or inserted. The fitting protrusions 137 provided on the upper surface and the lower surface of the flange part 37 move into the fitting grooves 72A and 73A provided on the rollers 72 and 73 of the guide unit 70. Therefore, the fitting protrusions 137 caught by the fitting grooves 72A and 73A prevent the flange part 37 from moving left/right.

[0059] A washing machine as described above has an advantage in that when the locking unit unlocks the detergent box, the detergent box is easily withdrawn owing to the automatic withdrawing unit, thereby improving the user convenience. Also, when the detergent box is withdrawn or inserted, the withdrawal distance and an insertion distance are set by the locking unit and the automatic withdrawing unit, thereby preventing incomplete withdrawal and insertion of the detergent box.

[0060] Any reference in this specification to "one embodiment," "an embodiment," "example embodiment," etc., means that a particular feature, structure, or characteristic described in connection with the embodiment is included in at least one embodiment of the invention. The appearances of such phrases in various places in the specification are not necessarily all referring to the same embodiment. Further, when a particular feature, structure, or characteristic is described in connection with any embodiment, it is submitted that it is within the purview of one skilled in the art to effect such feature, structure, or characteristic in connection with other ones of the embodiments.

[0061] Although a number of illustrative embodiments have been described, it should be understood that numerous other modifications and embodiments can be devised by those skilled in the art that will fall within the spirit and scope of the principles of this disclosure. More particularly, variations and modifications are possible in the component parts and/or combinations which would fall within the scope of the disclosure, the drawings and the appended claims. In addition to variations and modifications in the component parts and/or arrangements, alternative uses will also be apparent to those skilled in the art.

Claims

1. A washing machine (1), comprising:

a dispenser (20) that dispenses washing aids into a tub (4) of the washing machine (1);
a detergent box (30) that is movably mounted in

the dispenser (20), wherein the detergent box (30) can be withdrawn from the dispenser (20) to an open position at which washing aids can be placed in the detergent box (30);
a locking unit (40) that operates to lock the detergent box (30) in a closed position within the dispenser (20); and
an automatic withdrawing unit (50; 100) that includes a tension member (55) coupled between the detergent box (30) and the dispenser (20), wherein the tension member (55) applies a force to the detergent box (30) that biases the detergent box (30) to the open position.

2. The washing machine as claimed in claim 1, wherein the tension member (55) comprises an elongated, thin flexible member.

3. The washing machine as claimed in claim 1, wherein the automatic withdrawing unit (50; 100) further comprises:

a housing (51);
a shaft (52) that is rotatably mounted on the housing (51);
a reel (54) mounted on the shaft (52), wherein the tension member (55) is coupled to and wound upon the shaft (52); and
an elastic member (53) that biases the shaft (52) to rotate in a direction that causes the tension member (55) to be wound up around the reel (54).

4. The washing machine as claimed in claim 3, wherein a first end of the tension member (55) is coupled to the shaft (52), wherein the housing (51) is coupled to one of the dispenser (20) and the detergent box (30), and wherein a second end of the tension member (55) is coupled to the other of the dispenser (20) and the detergent box (30).

5. The washing machine as claimed in claim 4, further comprising a holder (59) coupled to the second end of the tension member (55).

6. The washing machine as claimed in claim 3, wherein the elastic member (53) comprises a spring that is also wound upon the shaft (52).

7. The washing machine as claimed in claim 6, wherein a first end of the spring is coupled to the shaft (52) and wherein a second end of the spring is coupled to the housing (51).

8. The washing machine as claimed in claim 3, wherein the housing (51) has at least one doorway (57) for enabling entrance and exit of the tension member (55).

9. The washing machine as claimed in claim 8, wherein the housing (51) includes first and second doorways located on opposite sides of the housing such that the housing can be mounted in two different orientations.

10. The washing machine as claimed in claim 3, wherein the housing (51) comprises a partitioning wall (58) that partitions a space inside the housing into a reel space (51A) and an elastic member space (51B).

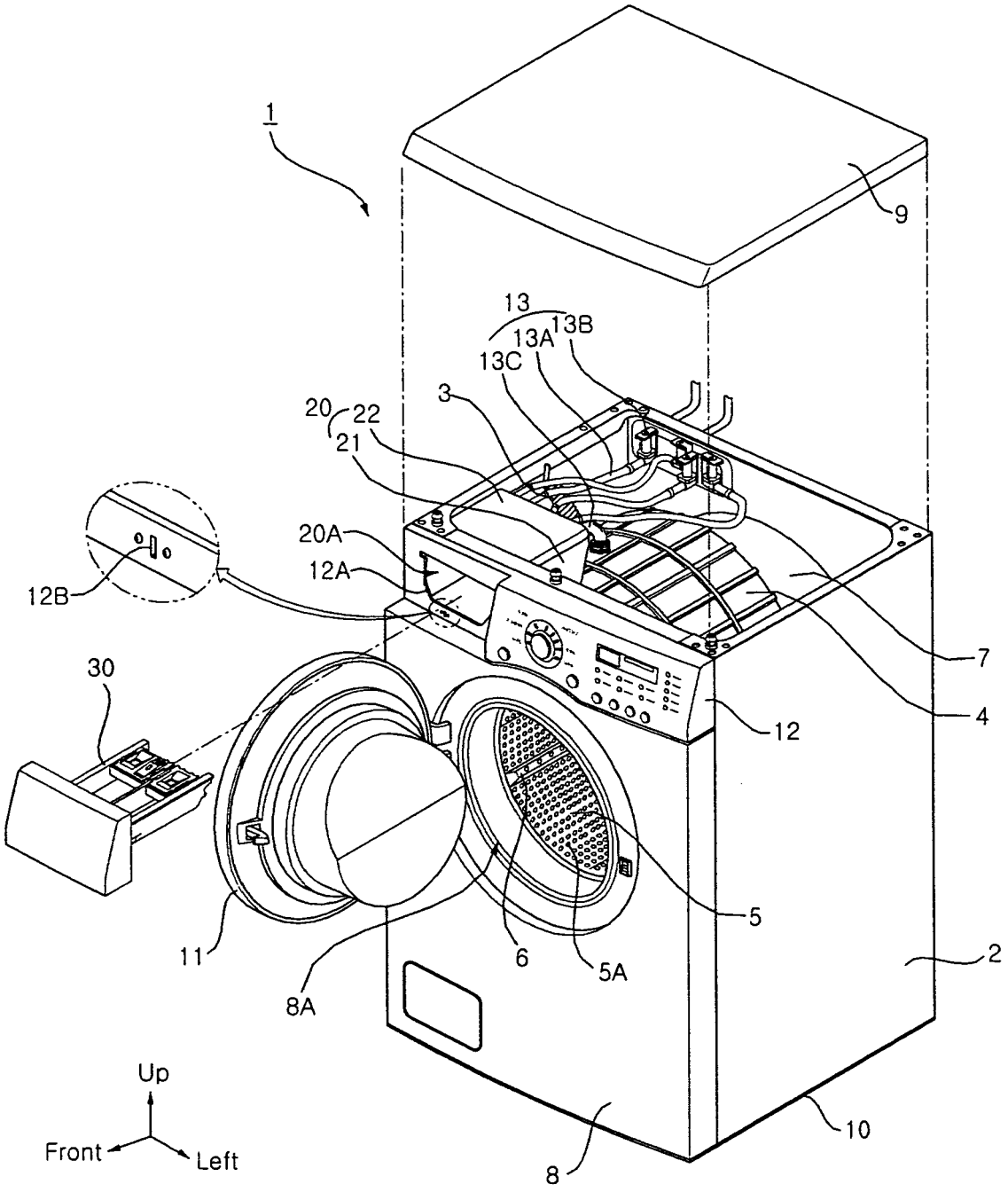
11. The washing machine as claimed in one of claims 3 to 10, wherein the automatic withdrawing unit (50; 100) further comprises a damping unit (60) that limits a rotational speed of the shaft (52).

12. The washing machine as claimed in one of claims 1 to 10, wherein the detergent box (30) has flanges (37) that extend along sides of the detergent box (30), and further comprising guide units (70) mounted on opposite sides of the dispenser (20), wherein the flanges (37) on the sides of the detergent box (30) are received in and guided by the guide units (70).

13. The washing machine as claimed in claim 12, wherein the flanges (37) include horizontally extending portions that extend horizontally away from sides of the detergent box (30), and vertically extending portions (137) that extend vertically from the horizontal portions.

14. The washing machine as claimed in claim 13, wherein the guide units (70) include rollers (72, 73) having grooves (72A, 73A) therein, wherein the grooves of the rollers receive the vertically extending portions (137) of the flanges (37).

FIG. 1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13
13A
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13C
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21
20A
12A
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5A
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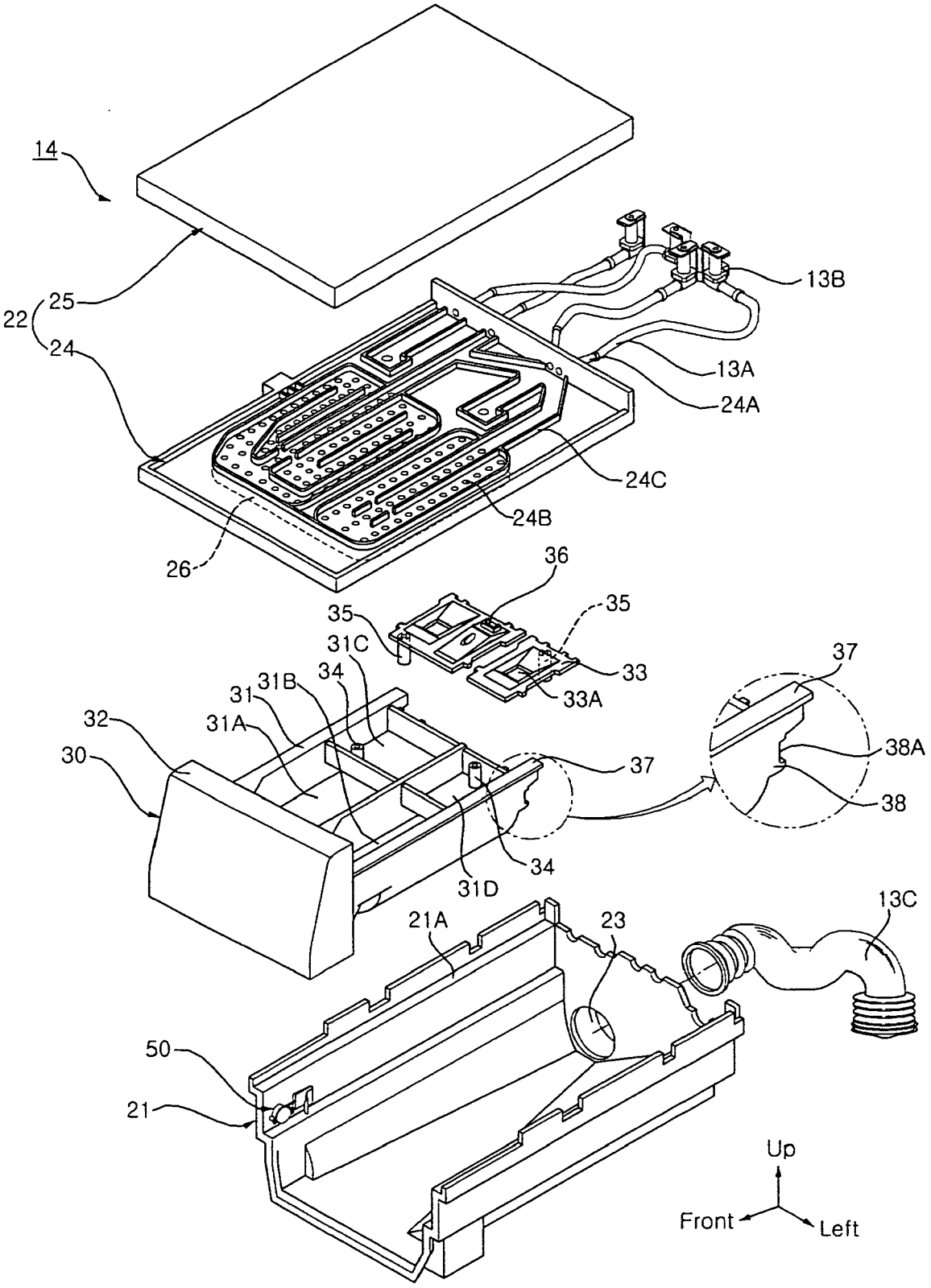
FIG. 2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25
24
13B
13A
24A
24C
24B
26
36
35
35
31C
33
33A
37
31
31B
34
32
31A
30
37
38A
38
34
31D
13C
21A
23
50
21
Up
Front
Left

FIG. 3

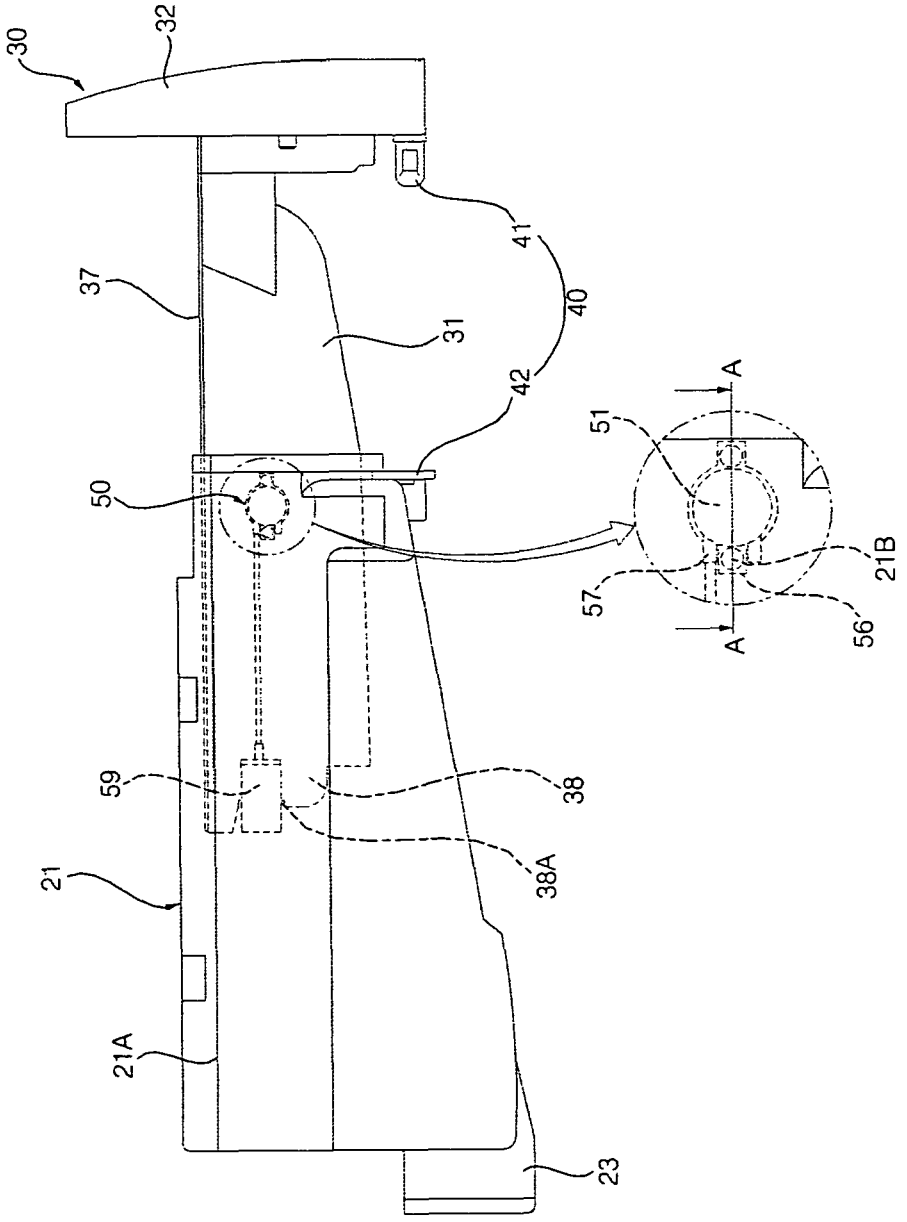


FIG. 4

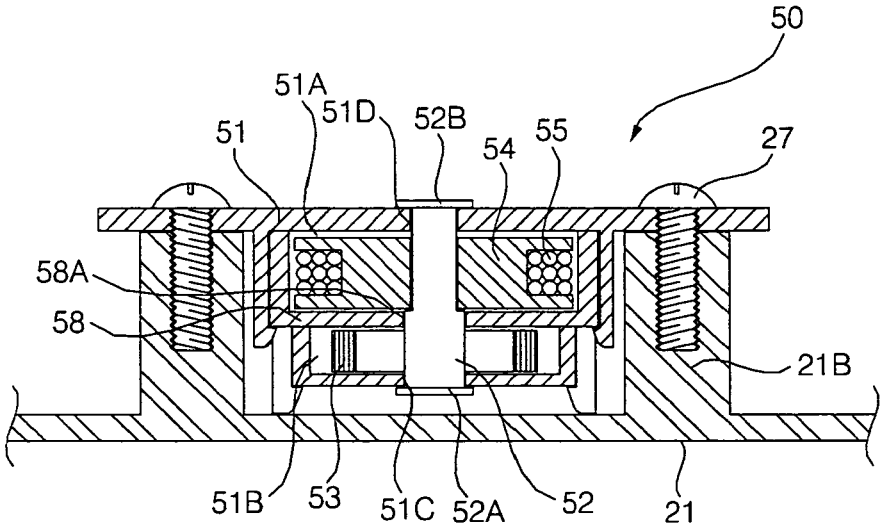
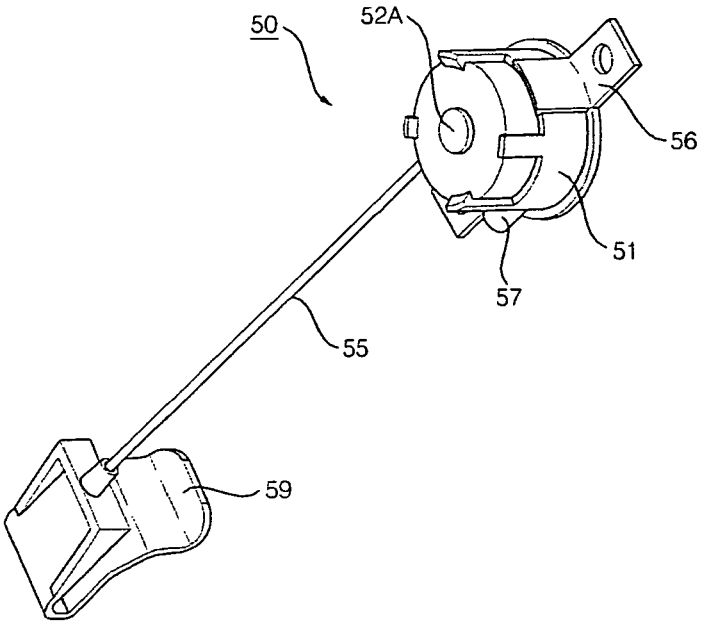

50
51A
51D
52B
51
54
55
27
58A
58
21B
51B
53
51C
52A
52
21

FIG. 5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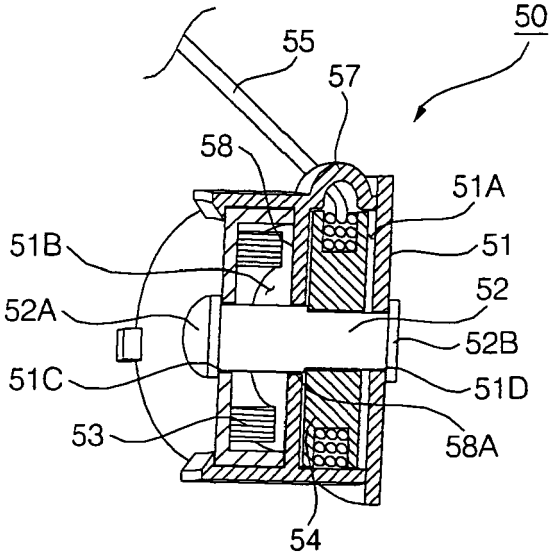
52A
56
51
57
55
59

FIG. 6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58
51A
51B
51
52
52A
52B
51C
51D
53
58A
54

FIG. 7

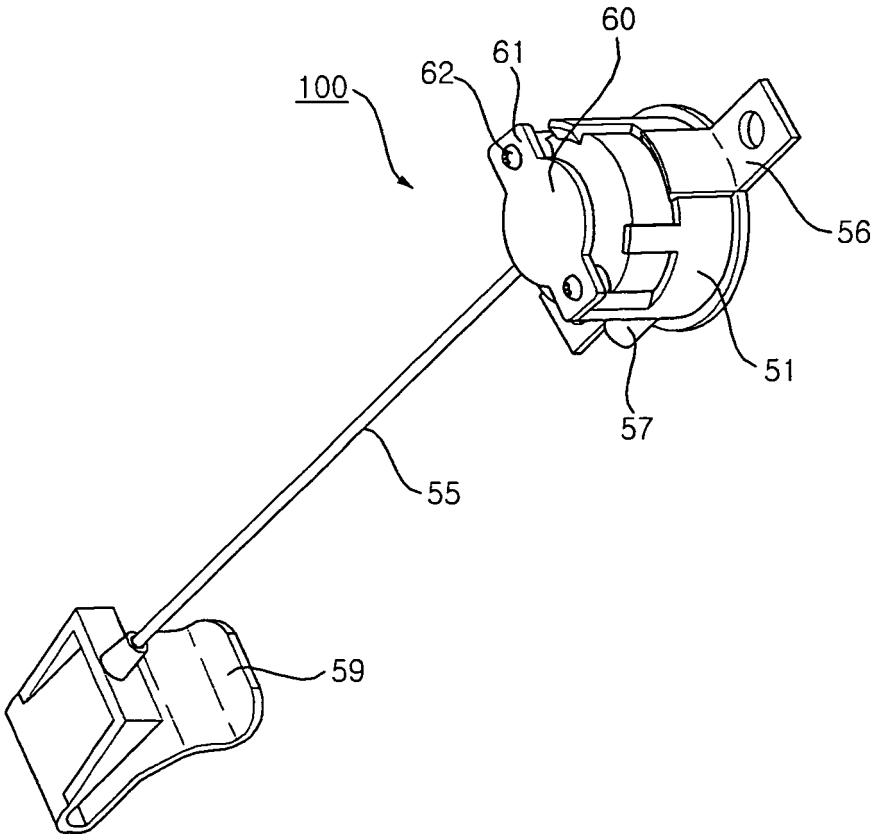

60
61
62
100
56
51
57
55
59

FIG. 8

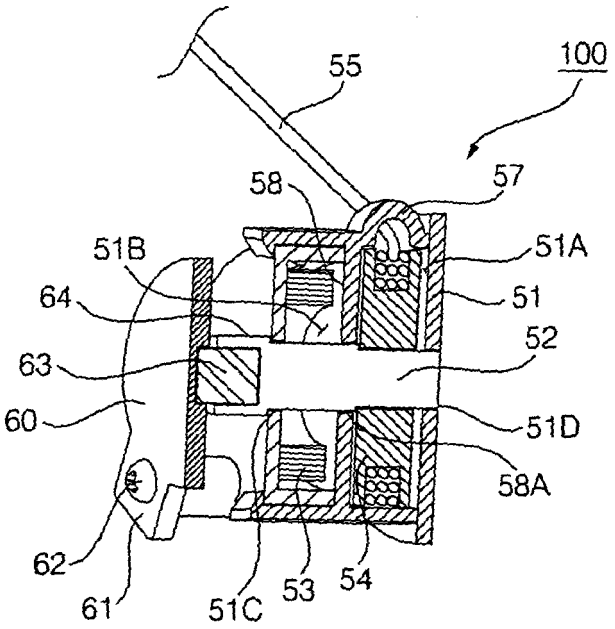


FIG. 9

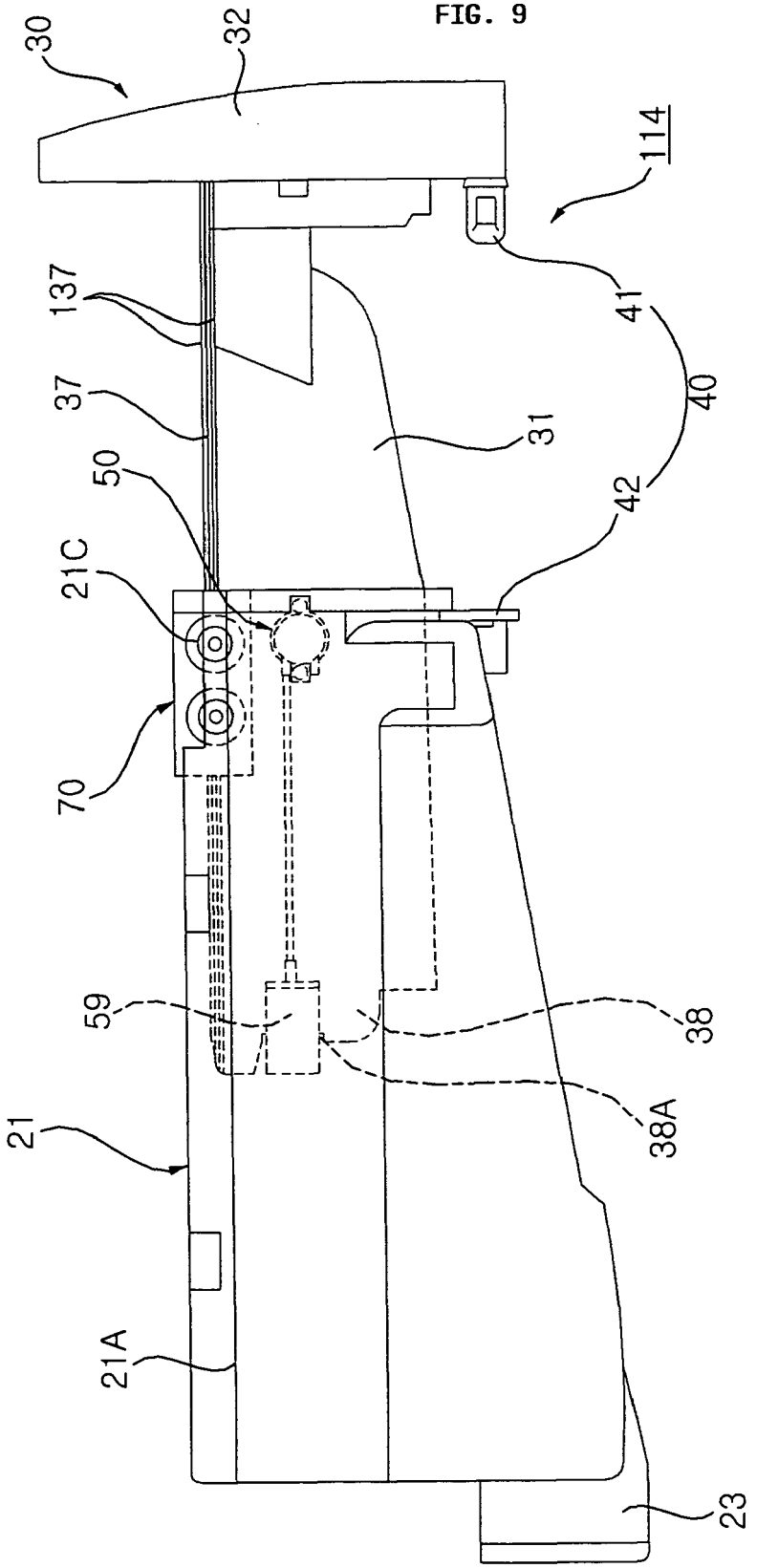
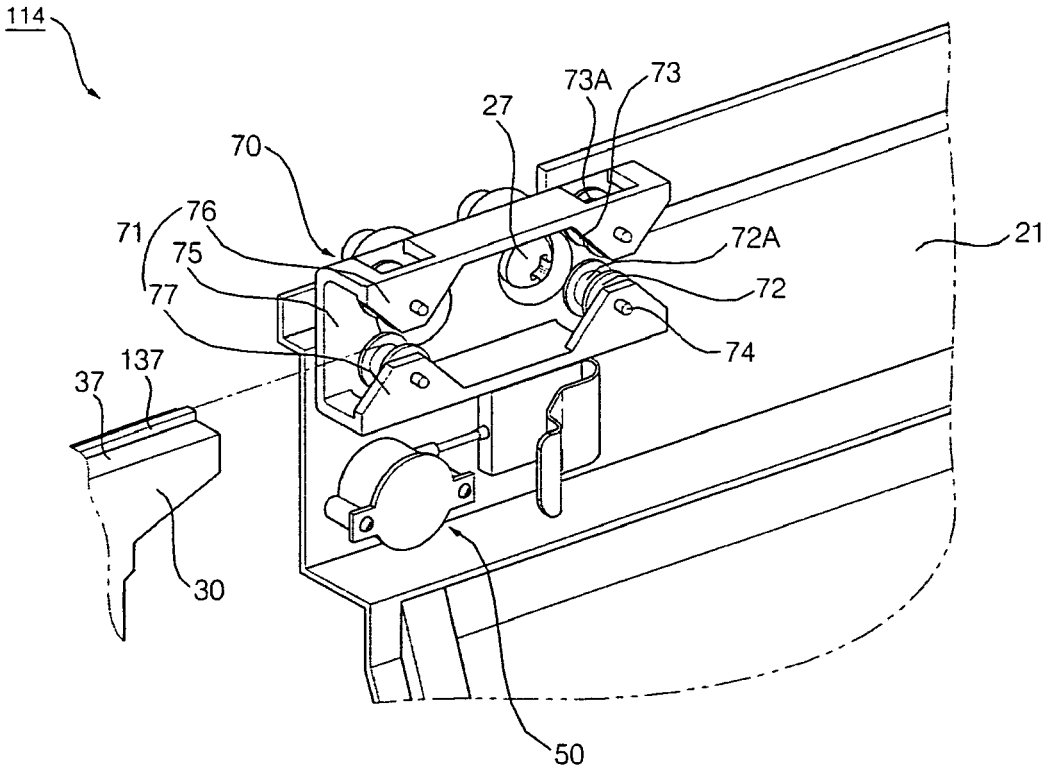


FIG. 10



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Application Number
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